

**F-2 STREAM CROSSING****PURPOSE & APPLICATIONS**

A stream crossing is a structure placed across or in a waterway to provide access for a period of less than one year. Temporary access crossings shall not be utilized to maintain traffic for the general public. The purpose of a stream crossing is to provide safe, pollution-free access across a waterway by establishing minimum standards and specifications for the construction and maintenance of the project. Temporary stream crossings are necessary to prevent construction equipment from damaging the waterway, blocking fish migration, and tracking sediment and other pollutants. They should be planned to be in service for the shortest practical period of time and removed as soon as their function is completed.

This measure is applicable in non-tidal waterways. These standards and specifications provide designs based on waterway geometry rather than the drainage area contributing to the point of crossing. Structural utility and safety must also be considered when designing waterway crossings to withstand expected loads and standard accepted engineering design should be used to size these structures.

**CONSIDERATIONS**

The specifications contained in this practice pertain primarily to flow capacity and resistance to washout of the structure. From a safety and utility standpoint, the designer must also be sure that the span is capable of withstanding the expected loads from heavy construction equipment, which will cross the structure.

The designer must also be aware that such structures are subject to the rules and regulations of the U.S. Army Corps of Engineers for in-stream modifications (404 permits) and the Maine DEP under the Natural Resources Protection Act.

These structures should not become a channel constriction, which can cause flow backups or washouts during periods of high flow. They should be planned to be in service for the shortest practical period of time and to be removed as soon as their function is completed. It should not be in place during the spring thaw and rains unless sized accordingly.

- Care must be taken to minimize erosion and movement of sediment due to disturbance of stream banks and bottom substrate.
- Timing the installation of this measure is critical to minimize impacts on fisheries.
- Arch culverts are preferred to standard culverts for the preservation of fish habitat because they are easier to embed and backfill with natural material.
- A regional biologist from the Department of Inland Fisheries and Wildlife should be consulted to determine the timing of local fisheries spawning and migration patterns so impact is minimized to fisheries.
- Overall road planning and design should be carefully considered to minimize the number of stream crossings required.
- If undersized, it may contribute to a flooding hazard.

**SPECIFICATIONS**

Additional information and guidance may be available from the Maine Forest Services.

**Planning Criteria**

**In-Stream Excavation:** In-stream excavation shall be limited to only that necessary to allow installation of the standard measures as presented in this specification.

**Elimination of Fish Migration Barriers:** The construction of any specific crossing method shall not cause a significant water level difference between the upstream and downstream water surface elevations that could effect fish passage and bridges pose the least potential for creating barriers to aquatic migrations.

**Crossing Alignment:** The temporary waterway crossing shall be at right angles to the stream. Where approach conditions dictate, the crossing may vary 15% from a line drawn perpendicular to the centerline of the stream at the intended crossing location.

**Road Approaches** The centerline of both road approaches shall coincide with the crossing alignment centerline for a minimum distance of 50 feet from each bank of the waterway being crossed. Based on the slope of the approaches, additional distance may need to be added on. When a physical or right-of-way restraint precludes the 50 feet minimum may need the evaluation from a professional.

**Surface Water Diverting Structure:** A water diverting structure such as a swale shall be constructed (across the roadway on both roadway approaches) 50 feet (maximum) on either side of the waterway crossing. This will prevent roadway surface runoff from directly entering the waterway. The 50 feet is measured from the top of the waterway bank. Design criteria for this diverting structure shall be in accordance with the "Standard and Specification" for the individual design standard of choice. If the roadway approach is constructed with a reverse grade away from the waterway, a separate diverting structure is not required. Additional information may be available from the Maine forest Services.

**Back-up erosion control devices:** Streams are considered to be highly sensitive areas and all construction work around waterways should have a back-up set of erosion control measures installed to protect the stream should the first set of measures fail. For example, silt fencing can be installed along the stream perimeter to protect the stream from sedimentation and as a back-up measure, temporary mulch such as erosion control mix can be applied on disturbed areas at the end of each day or prior to anticipated storm events. Combinations of accepted measures can be used along streams.

**Road Width:** Temporary crossings shall have one traffic lane. The minimum width shall be 12 feet with a maximum width of 20 feet.

**Fisheries Restrictions and Permits:** A permit from the Maine DEP will be needed to install and remove temporary access culverts in streams. Installation and removal may not be permitted during the period of time from the start of trout spawning until the eggs have hatched. In some instances, restrictions may also be applied to bass spawning waters. Check with the Inland Fish and Wildlife Department.

**Water Fluctuation:** The base flows of all streams must be maintained during spawning time. In addition, for bass and warm water species, the water level fluctuation should be no greater than one (1) foot during the time period from May 1st - July 1st.

**Time of year:** The construction must be timed to take advantage of seasons with low or no stream flow (generally late summer months) to minimize downstream impacts from sedimentation.

**Soil Aggregate:** There shall be no sands, silts, clays or organic materials used for construction within the waterway channel. Washed coarse aggregate (3/4" to 4") referenced as AASHTO designation No. 1 shall be the minimum acceptable aggregate size for temporary crossings. Larger clean aggregates will be allowed.

**Geotextile:** Geotextile fabric is either woven or nonwoven plastic, polypropylene, or nylon used to distribute the load, retain fines, allow increased drainage of the aggregate and reduce mixing of the aggregate with the subgrade soil.

### **Design Criteria**

The following criteria for erosion and sediment control shall be considered when selecting a specific temporary access water crossing standard method:

**Site Location:** Locate the temporary crossing where there will be the least disturbance to the soils of the existing waterway banks. When possible, locate the crossing at a point receiving minimal surface runoff.

**Vehicular loads and traffic patterns:** Vehicular loads, traffic patterns, and frequency of crossings should be considered in choosing a specific method.

**Maintenance of crossing:** The standard methods will require various amounts of maintenance. The bridge method should require the least maintenance, whereas the ford method will probably require the more intensive maintenance. Maintenance activities may require new permits.

**Temporary Stream Diversions:** Where sedimentation is expected to cause major damage downstream, temporary stream diversions shall be installed. Refer to the TEMPORARY STREAM DIVERSION BMP for information.

**Culvert Inlets & Outlets:** Reinforcement of culvert headwalls and outlets is generally required to protect the stream from chronic erosion and sedimentation. Refer to the PIPE INLET PROTECTION BMP and the PIPE OUTLET PROTECTION BMP for information.

**Site aesthetics:** Select a standard design method that will least disrupt the existing terrain of the stream reach. Consider the effort that will be required to restore the area after the temporary crossing is removed.

**Stabilization:** All areas disturbed during installation shall be stabilized within 14 calendar days of that disturbance in accordance with the STREAMBANK STABILIZATION BMP, PERMANENT VEGETATION BMP, TEMPORARY MULCHING BMP, or any other appropriate structural BMP. If vegetative stabilization is required, the project needs to be timed to use the growing season.

**NOTE:** *All mulching along streams requires anchoring with erosion control nets or mats.*

### **Temporary Access Culvert**

A temporary access culvert consists of a section(s) of circular pipe, pipe arches, or oval pipes of reinforcing concrete, corrugated metal, or structural plate with compacted backfill, which is used to convey slow moving water through the crossing.

#### **Considerations**

- The bank slopes and stability must be taken into consideration when selecting the method of stream crossing.
- Alignment of the culvert should follow the alignment of the stream channel.
- Culverts should be installed at or below streambed elevation.
- This temporary waterway crossing method is normally preferred over a ford type of crossing since disturbance to the waterway is only during construction.
- Temporary culverts can be salvaged and reused.

### **Construction Specifications**

**Culvert strength:** All culverts shall be strong enough to support their cross sectional area under the expected maximum loads.

**Culvert Size:** The cross sectional area of the culvert pipe shall be the largest pipe diameter equal to the undisturbed cross sectional area of the bank full condition of the stream. It should fit into the existing channel without major excavation of the waterway channel or without major approach fills. If a channel width exceeds 3 feet, additional pipes may be used until the cross sectional area of the pipes approaches that of the existing channel. The minimum size culvert that may be used is an 18-inch diameter pipe.

Where watersheds are larger than 1 square mile (640 acres), then the culvert may have to be sized for a larger storm event such as the 100-year storm to comply with federal regulations.

**Culvert Length:** The culvert(s) shall extend a minimum of one foot beyond the upstream and downstream toe of the aggregate placed around the culvert. In no case shall the temporary culvert exceed the width needed to access the work location with a single lane.

**Geotextile Fabric:** Geotextile fabric shall be placed on the streambed and streambanks prior to placement of the pipe culvert(s) and aggregate. The filter fabric shall cover the streambed and extend a minimum six inches and a maximum one-foot beyond the end of the culvert and bedding material. Geotextile fabric reduces settlement and improves crossing stability.

**Culvert Placement:** The invert elevation of the culvert shall be installed at or below the natural streambed grade to minimize interference with fish migration (free passage of fish).

**Culvert Protection:** The culvert(s) shall be covered with a minimum of one foot of aggregate. If multiple culverts are used, they shall be separated by at least 12 inches of compacted aggregate fill. At the minimum, the bedding and fill material used in the construction of the temporary access culvert crossings shall conform to the aggregate requirements cited above.

### **Temporary Access Ford**

A temporary access ford is a shallow structure placed in the bottom of a waterway over which the water flows while still allowing traffic to cross the waterway. Where fish passage is a concern, at least one portion of the ford shall have 6 inches of flow depth over the top of the ford, or equal to the minimum flow depth at all time.

#### **Considerations**

Temporary fords may be used when the streambanks are less than three (3) feet above the invert of the stream, and the streambed is armored with naturally occurring bedrock, or can be protected with an aggregate layer in conformance with these specifications.

- The approaches to the structure shall consist of a stone pad constructed to comply with the aggregate requirements of the General Requirements section. The entire ford approach (where banks were cut) shall be covered with filter cloth and protected with aggregate to a depth of four (4) inches.
- The approach roads at the cut banks shall be no steeper than 5H: 1V. Spoil material from the banks shall be stored out of the flood plain and stabilized.
- One layer of geotextile fabric shall be placed on the streambed, streambanks and road approaches prior to placing the bedding material on the stream channel or approaches. The fabric will be a minimum of six (6) inches and a maximum one-foot beyond the bedding material.
- The bedding material shall be coarse aggregate or gabion mattresses filled with coarse aggregate. If gabion mattresses are used, they will be of plastic, weighted, screen type.
- All fords shall be constructed to minimize the blockage of stream flow and shall allow free flow over the ford. The placing of any material in the waterway bed will cause some upstream ponding. The depth of this ponding will be equivalent to the depth of the material placed within the stream and therefore should be kept to a minimum height. However, in no case will the bedding material be placed deeper than 12 inches or one-half (1/2) the height of the existing banks which ever is smaller.

### **Access Bridge**

A temporary access bridge is a structure made of wood, metal, or other material, which provides access across a stream or waterway.

#### **Considerations**

- This is the preferred method for temporary access waterway crossings. Normally, bridge construction causes the least disturbance to the waterway bed and banks when compared to the other access waterway crossings.
- Most bridges can be quickly removed and reused.
- Temporary access bridges pose the least chance for interference with fish migration when compared to the other temporary access waterway crossings. Bridge use and removal should not significantly affect the stream or its banks.

#### **Construction Specifications:**

**Bridge Placement:** A temporary bridge structure shall be constructed at or above bank elevation to prevent the entrapment of floating materials and debris.

**Abutments:** Abutments shall be placed parallel to and at the top of stable banks.

**Bridge Span:** Bridges shall be constructed to span the entire channel. The span is dependent upon loading and material used. Consult a qualified engineer for the design. No footing, pier or bridge support will be permitted within the channel for waterways less than 8 feet wide.

**Stringers:** Stringers shall either be logs, sawn timber, pre-stressed concrete beams, metal beams, or other approved materials.

**Deck Material:** Decking shall be of sufficient strength to support the anticipated load. All decking members shall be placed perpendicular to the stringers, butted tightly and securely fastened to the stringers. Decking materials must be butted tightly to prevent any soil material tracked onto the bridge from falling into the waterway below.

**Run Planks** (optional): Run planking shall be securely fastened to the length of the span. Run planks shall be provided for each track of the equipment wheels. Although run planks are optional, they may be necessary to properly distribute loads.

**Curbs or Fenders:** Curbs or fenders must be installed along the outer sides of the deck. Curbs or fenders are an option, which will provide additional safety.

**Bridge Anchors:** Temporary bridges shall be securely anchored at one end using steel cable or chain. Anchoring at only one end will prevent channel obstruction in the event that floodwaters float the bridge. Acceptable anchors are large trees, large boulders, or driven steel anchors. Anchoring shall be sufficient to prevent the bridge from floating downstream and possibly causing an obstruction to the flow.

## ***MAINTENANCE***

- **Time of Operation:** All temporary crossings shall be removed within 14 calendar days after the structure is no longer needed. All structures shall be removed within one year from the date of installation.
- **Stabilization:** All areas disturbed during ford installation shall be stabilized immediately in accordance with the STREAMBANK STABILIZATION BMP.
- **Inspection:** Periodic inspection must be performed to ensure that the bridge, culverts, fords, streambed and stream banks are maintained and not damaged, that sediment is not entering the stream or blocking fish passage or migration.
- **Maintenance:** Maintenance shall be performed, as needed to ensure that the structure complies with the standard and specifications for each BMP. This shall include the removal and disposal of any trapped sediment or debris. Sediment shall be disposed of outside of the flood plain and stabilized.
- **Removal:** When the temporary structure has served its purpose, including bridge abutments or culverts and other bridging materials shall be removed within 14 calendar days. Care should be taken so that any aggregate left does not create an impoundment or restrict fish passage.
- **Final Clean up:** Final clean up shall consist of removal of excess materials from the waterway and protection of banks from erosion. All materials shall be stored outside the waterway flood plain. Clean up shall be accomplished without construction equipment working in the stream channel.
- **Approach Disposition:** The approach slopes of the cut banks shall not be backfilled.
- **Final Stabilization:** All areas disturbed during ford removal shall be stabilized immediately in accordance with the STREAMBANK STABILIZATION BMP.





